



**Calaveras County Water District – Phase 1: Stanislaus River  
Reconnaissance-level Conjunctive Use Evaluation  
Local Groundwater Assistance Program; Proposition 84, Chapter 2  
Attachment 8 – Quality Assurance**

Demonstrate that appropriate and well-defined Quality Assurance and Quality Control (QA/QC) measures will be used in each task. The information-gained discussion and QA/QC plan in this section should be consistent and incorporated into the project work plan. QA/QC measures may include, but are not limited to the following:

- ↳ Procedural assurances, such as review processes for quality of reports, data, and lab analyses
- ↳ An existing or proposed QA/QC plan for field sampling and lab analysis of water quality that ensures high accuracy and precision
- ↳ Personnel qualifications that may include professional registrations (such as a California Professional Geologist or Professional Engineer), certifications, and experience of persons performing and overseeing work to be performed
- ↳ Standardized methodologies to be used, such as construction standards, health and safety standards, laboratory analysis, or accepted soils classifications methods
- ↳ Standardized analyses, such as statistical tests or American Society for Testing and Materials and U.S. Environmental Protection Agency analytical methodologies
- ↳ Quality requirements of material or computational methods, such as use of specific grades of building materials or use of specific, tested, and established models (or software)
- ↳ Comparison and calibration of models with actual data to enhance accuracy of modeling results

Overview: As described in Attachment 5 – Work Plan, quality assurance and quality control (QA/QC) is integrated into project management from project inception to the preparation of the final documents. To provide QA/QC, review of all project deliverables will be completed by senior members of the Consultant Team who will be familiar with, but not directly involved in, the project work to provide a fresh look at the documents. There is no field sampling or lab analyses in the project. More detailed discussion of specific QA/QC procedures follows.

QA/QC and Project Management Procedures: The project management measures that are integral to QA/QC are detailed in Attachment 5- Work Plan and include:

- Project Memorandum
- Timely Meetings and Telephone Conversations

In particular, QA/QC starts with a common understanding of the project scope, budget, and schedule as documented in the Project Memorandum which provides a road-map for project execution by the consultant team. The Project Memorandum includes QC and review periods and holidays. Furthermore, timely communications between the consultant team, CCWD, and OID during the project execution keep assignments on track by allowing information and ideas to be exchanged, provide a venue to identify bottlenecks or challenges and develop timely resolution to these bottlenecks and challenges. Timely meetings and communications are also an essential element of cost and schedule control.

Work Product Review: To provide QA/QC, review of all project deliverables from development of individual sections to compilation of the final work product will be completed before they are submitted to CCWD and OID. Document review will be completed by senior members of the Consultant Team



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who will be familiar with, but not directly involved in, the project work to provide a fresh look at the narrative. Topics to be reviewed will include conjunctive use screening assumptions, surface water and groundwater modeling assumptions and calculations, engineering and cost estimating assumptions and calculations, and general technical editing of narrative.

**Concept and Criteria Review Meeting:** In addition to review of work product, early in an assignment, an internal Concept and Criteria Review will be conducted to discuss the project approach and key assumptions, identify issues that might affect the project, and confirm the schedule for internal review of work products. This meeting provides the opportunity for senior staff to become familiar with the project and review the planning assumptions with the consultant team prior to review of the work products and to identify “lessons learned” from prior similar work. The review focus is on the technical aspects of the project.

**Work Product Standards:** It should be noted that the models that are being used in the conduct of this work as described in Attachment 5- Work Plan are existing calibrated models that have already undergone QA/QC review by entities such as the US Geological Survey prior to their use in this project. In addition, the consultant team will use standardized methods in the preparation of work product such as the use of American Association of Cost Engineers (AACE) cost estimating methods which are integrated with local knowledge and information.

**Personnel Qualifications:** The execution of this work will be primarily by a consultant team using personnel with prior experience in the evaluation of surface water and groundwater resources as well as in the analysis of conjunctive use feasibility. In addition, the individual staff of CCWD and OID bring specific localized expertise in their respective service areas in topics such as surface water infrastructure capacity, delivery, and operations; groundwater facilities and operations; as well as a sense for local interest and concerns. The consultant team involved in this project include senior water resources and hydrogeologic professionals with a collective experience of over 60 years in these types of analyses. A summary of the consultant team members and their roles is provided below and detailed resumes are attached.

Sachi Itagaki, P.E. – Senior Water Resources Manager/Project Manager

Bob Abrams, Ph.D., P.G., C.Hg. – Hydrogeologist and Groundwater Modeling

Jeff Meyer, P.E. – Surface Water Analysis

Jared Emery, EIT – Surface Water Modeling

Sachiko Itagaki, P.E.

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## Senior Water Resources Engineer

### Education

MS, Civil Engineering (Water Resources with Emphasis in Groundwater Hydrology),  
Stanford University  
BS, Ocean Engineering, Stanford University

### Registration

Professional Engineer: California

### Professional Summary

Ms. Itagaki has over 25 years of water resources and civil engineering experience, specifically in conducting water resource planning and management programs including surface water and groundwater investigations; integrated regional water management plans; utility (water, recycled water, wastewater, and stormwater) infrastructure management, master planning, modeling, and design studies; water quality and hazardous waste investigations; supporting the preparation of CEQA Compliance documents and obtaining project permits; and preparing and implementing grant funded projects.

Her specific relevant project experience includes:

#### Integrated Water Planning

- *Santa Cruz County, Conjunctive Use Study.* Project Manager for project to evaluate surface water/recycled water availability for water transfer and reuse to enhance conjunctive use of water within Santa Margarita Groundwater Basin. Project included evaluation of regional water demands, surface water diversion opportunities and constraints from the San Lorenzo River and its tributaries, in-lieu and direct aquifer recharge opportunities including recharge at quarries, aquifer injection, stormwater treatment and recharge using enhanced low impact development methods, and water transfer.
- *Tuolumne- Stanislaus Regional Water Management Group, Tuolumne Utilities District, Sonora, CA.*
  - Lead Writer for highly ranked Proposition 84 IRWM Program Planning Grant application and
  - Project Manager for Preparation of IRWM Plan for the Tuolumne Stanislaus Region starting in October 2011 requiring organizing and presenting at stakeholder meeting including preparation of agendas, presentations, and handouts, leading public outreach to Disadvantaged Communities (DAC) as well as Native American Tribes to better understand water management challenges and opportunities, identification and development of projects/programs/actions that benefit the region as a whole as well as DAC and Native American Tribes, and guiding the sequential crafting and editing of the IRWM Plan for presentation to the Planning Grant Committee.

- *Scotts Valley Water District, Groundwater, Recycled Water and Water Resources Services, Scotts Valley, California.* Ms. Itagaki was the project manager for a multi-disciplinary team that provides services in groundwater management and well design, recycled water facilities planning grant application, wastewater treatment and recycled water distribution facilities planning report preparation. The Recycled Water Facilities Planning Report included updated the original Recycled Water Master Plan to include evaluation of remaining recycled water demand within Scotts Valley as well as regionally within Santa Cruz. Scotts Valley is unique in that the projected available supply exceeds the potential demand therefore careful consideration of uses and benefits were explored. Recycled water uses considered included groundwater recharge, Santa Cruz golf course irrigation in exchange for wintertime potable water, and additional local irrigation and interior reuse.
- *Non-potable Water Supply Assessment for Mariposa Lakes Development, Stockton East Water District, Stockton, CA.* Project Manager for evaluation of water supply availability for large residential development in San Joaquin County. Project included review of wet and dry-season water supply availability from Central Valley Project based on water rights and operating rules, demand projections for existing and new development, water balance for conjunctive use operation, and evaluation of the adequacy of water supply to meet the needs of the project.
- *San Benito County Water District Groundwater Extraction Facilities Feasibility Study, San Benito County, CA.* Prepared feasibility design of well pump and booster pump stations, pipeline, and electrical to extract groundwater and pump into high pressure distribution system. Analysis included variable pumping costs as a function of energy costs and distribution pressure, development of capital construction costs, and evaluating regulatory needs.
- *September Ranch Development Water Resources Availability Assessment for Revised Environmental Impact Report, Monterey County, CA.* Task Leader for review of water rights availability legal opinion, hydrogeologic studies, geologic maps and preparation of water balance and hydrologic availability evaluation for proposed residential sub-division in Monterey County. The Water Resources study is in support of a Revised Environmental Impact Report for the project.
- *Water Resources Association of San Benito County, Alternatives Analysis, Groundwater Management Plan Update, and Programmatic Environmental Impact Report Technical Support, Hollister, CA.* Program Manager for preparation of alternative methods of managing groundwater in the Hollister area of San Benito County. Analysis included development of municipal and industrial water demand projections, preparation of groundwater balance under various water supply alternatives, and qualitative and quantitative evaluation of various combinations of water resources (imported and local surface water, groundwater, and recycled water) to meet future demands. Organized and presented analysis at two public meetings. Groundwater Management Plan Update included identification and development of 36 programs/projects including recycled water, distribution pipeline, constructed wetlands, water filtration/demineralization, water conservation, water banking to manage the water resources of San Benito County. Update also included prioritization of programs/projects and preparation of planning-level estimates of

probable costs of construction. Also provided Technical Support for Programmatic Environmental Impact Report for the Groundwater Management Plan Update including preliminary water balance analyses, development of water level operational goals, and potential wastewater disposal alternatives.

- *Nipomo Community Services District Evaluation of Water Supply Alternatives, Nipomo, CA.* Technical reviewer for water supply study that considered many different water sources including obtaining water from the State Water Project, intertie with adjoining water agency, desalination, recycled water, oil-field produced water, hard rock drilling, water conservation, groundwater storage and management. Study included projected demands, detailed evaluation of select alternatives, and recommended plan to pursue several alternatives to meet future water supply needs.
- *Twenty Nine Palms Water District AB3030 Groundwater Management Plan, Twenty Nine Palms, CA.* Technical review for preparation of AB3030 Groundwater Management Plan that includes review of hydrogeologic data, review of draft County groundwater ordinance, mitigation of conditions of overdraft, monitoring of groundwater levels and 10 other elements required by AB3030.
- *Lake Hemet Municipal Water District San Jacinto River Surface Water Availability Study, Hemet, CA.* Analyzed streamflow and precipitation data in complex system with many diversions and overflows. Goal of analysis was to estimate flows after municipal and agricultural uses have been accounted for and to conduct mass balance of flows. Used spreadsheet for data and statistical analysis.
- *Napa County Flood Control and Water Conservation District, Napa River Diversion Feasibility Study, Napa, CA.* Tasks included analysis of surface water hydrology to develop drainage area-runoff correlations and to assess availability of excess winter time flows; development of water rights data base, and assessment of existing and proposed storage sites, hydrogeologic reports, and water-level data to assess and review groundwater recharge/conjunctive use potential. Conjunctive Use evaluation included review of available USGS reports and County information to assess whether or not the existing hydrogeologic information was adequate to develop a feasibility-level groundwater conjunctive use project. The project would involve the release of stored surface water supplies for groundwater recharge purposes and the installation of M&I extraction wells in lieu of a water treatment plant facility upgrade and several miles of water transmission mains. Hydrogeologic reports, including well logs, lithologic cross-sections, historic pumpage quantities, rates of stream recharge and water quality, were reviewed and assessed to evaluate groundwater recharge and extraction potential.
- *Castaic Lake Water Agency Devil's Den Groundwater Safe Yield Study, Castaic Lake, CA.* Gathered and evaluated data such as precipitation, streamflow, cropping patterns, evaporation, groundwater inflows, and groundwater pumping to conduct water balance for a safe yield analysis. Directed selection of locations for new monitoring wells based on existing hydrogeologic information.
- *Antelope Valley Water Resources Agency Aquifer Storage and Recovery Feasibility Analysis, Antelope Valley, CA.* Evaluated existing hydrogeologic and water quality data for Antelope Valley aquifers. Selected potential surface infiltration and

subsurface injection sites based on surface and subsurface geology and location of potential source waters. Directed other technical staff in evaluation of water quality. Compared water quality of potential source waters to existing groundwater as part of feasibility analysis. Assessed overall feasibility of surface infiltration and subsurface injection program. Determined additional data needs to further evaluate specific sites.

- *Confidential Client, Hydrologic Study, Salton Sea, CA.* Evaluated whether groundwater quantities and quality were sufficient to serve both municipal and industrial supply and agricultural uses within each of the three-layer aquifer systems. Determined aquifer characteristics by analyzing groundwater well logs, developing schematic cross sections, and evaluating water-level and water quality data. Identified the availability of and evaluated the chemical composition of groundwater in a southern California basin to determine whether quantities would be sufficient to serve both municipal and industrial supply and agricultural uses. Assessed groundwater quality and yield by analyzing groundwater well logs, water-level and water quality data.
- *2008 Updated Integrated Regional Water Management Plan, Western Municipal Water District, Riverside, CA.* Project Manager for preparation of an integrated regional water management plan that includes extensive public outreach to both WMWD stakeholders as well as disadvantaged communities within WMWD's service area. Outreach meeting topics include regional recycled water needs, water and environmental restoration, integration of flood control to water management, land use changes and impact on water supply, land use based water demands, and funding opportunities. The project also included update of development projected water demands for ten subagencies of Western, evaluation of demand management measures and implementation of water use efficiency master plan, identification of water source opportunities including groundwater, recycled water, brackish groundwater desalination, conjunctive use to meet long-term demands and to meet short-term water needs resulting from facilities outages. Project also included call for projects and evaluation and categorization of projects.
- *Westside Sacramento Regional Water Management Group, Yolo County Flood Control and Water Conservation District, Woodland, CA.* Project Manager for preparation of IRWM Plan starting in November 2011 requiring extensive public outreach and stakeholder involvement for the Cache Creek Sub-Watershed in Lake and Yolo Counties, the Putah Creek Sub-Watershed in Napa and Solano Counties, and adjacent Bay-Delta areas. IRWM Plan preparation includes preparation of water budgets to better understand the water management challenges and opportunities within a sub-watershed and within the region, preparation of a public outreach website, and research and analysis necessary for elements of the IRWM Plan.
- *Santa Clara Valley Water District Advanced Recycled Water Treatment Program: Evaluation of Surface Water and Groundwater Facilities, Santa Clara County, CA..* Task Leader for inventory and evaluation of surface water reservoirs and groundwater storage facilities within Santa Clara County. Preparation of technical memorandum included review of depth, length and detention time analysis of surface water reservoirs, analysis of water quality and storage availability in groundwater,

and identification of opportunities for direct and indirect recycled water use portions of Santa Clara County.

- *Scotts Valley Water District, Concept Proposal for LID Retrofits for Groundwater Recharge, Scotts Valley, CA.* Project Manager for further development of LID retrofit measures at targeted areas within Scotts Valley. Measures considered included pervious pavement, bioretention, downspout disconnection for planter boxes, and rainwater/stormwater storage and infiltration with the aim of both improving water quality and enhancing groundwater recharge in an overdrafted aquifer.
- *San Francisco Public Utilities Commission, Groundwater Conjunctive Use - Stormwater Management and Treatment, San Francisco, CA.* Technical Advisor. for grading, drainage and implementation of LID stormwater treatment features to comply with Municipal Regional Permit at 16 separate groundwater well sites. Treatment features included concepts such as vegetated swales, disconnected impervious and rain gardens.
- *Scotts Valley Water District, Development Review for Woodside at Scotts Valley, Scotts Valley, CA.* Technical Reviewer for stormwater management features for proposed development. Features reviewed include disconnected impervious area, bioretention, and retention facilities to facilitate improved groundwater recharge in overdrafted aquifer.

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Robert H. Abrams, Ph.D., P.G., C.Hg.

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## Hydrogeologist / Groundwater Modeler

### Education

Ph.D., Hydrogeology, Stanford, 1999  
M.S., Hydrogeology, Stanford, 1996  
B.S., Geology, San Francisco State University, 1991

### Professional Registration

Professional Geologist, California, license number 8703  
Certified Hydrogeologist, California, license number 931

### Professional Summary

Dr. Robert (Bob) Abrams has over 18 years of professional experience applying groundwater and hydrologic models for research and practical applications. Bob's professional experience includes groundwater-banking evaluations, water-supply evaluations, determination of stormflow generation mechanisms, the fate and transport of dissolved inorganic and organic compounds, the development and fate of redox zones, the impact of chemically variable sorption on solute transport, and characterization of shallow subsurface LNAPL distribution and recovery times.

### Relevant Professional Experience

- *Antelope Valley-East Kern Water Agency (AVEK), Groundwater Banking and Blending Study, Quartz Hill, CA.* Two local-scale groundwater flow and solute transport models were developed from different sub-regions of the USGS regional Antelope Valley MODFLOW model. The local-scale model was used to evaluate the impact of groundwater banking operations on total organic carbon (TOC) concentrations of native groundwater.
- *Processes Unlimited International, Famoso Groundwater Banking Waste Discharge Requirements Support, Famoso, CA.* To support a Report of Waste Discharge and draft Water Discharge Requirements to the Central Valley Regional Water Quality Control Board (CVRWQCB), 1D, 2D, and 3D variably saturated flow and reactive transport models were developed to assess the impact to groundwater of arsenic, sodium, and boron. Representative soil profiles were developed with data from sparse soil borings and well logs. The model simulated reactive solute transport through the unsaturated zone and the development of a groundwater mound related to groundwater banking operations.
- *Calleguas Municipal Water District, Somis Desalter Feasibility Study, Las Posas Basin, Ventura County, CA.* Developed complex geologic model in the fold-thrust terrane of the Las Posas Basin in eastern Ventura County. The geologic model formed the foundation for preliminary wellfield design and estimation of available groundwater for desalter operations. Groundwater in the study area is strictly managed, and a principal constraint for the client was avoiding conflict with agricultural groundwater extractions.
- *Los Angeles Department of Water and Power, Evaluation of Proposed Water Storage/Transfer Potential in Fremont Valley Basin, Fremont Valley, CA.* Evaluated geologic, hydrologic, and hydrogeologic data to assess the suitability for establishing a groundwater banking operation. Deliverable was a report that included recommendations

on further field-based and modeling studies deemed necessary to address data and knowledge gaps.

- *City of Longview, Design and Construction of a New Groundwater Source and Treatment Facility, Longview, WA.* Developed and implemented a three-dimensional, groundwater flow and solute transport model to assess water sources for a new 20 MGD water treatment plant. A detailed geologic model was developed for this project. The model was used to evaluate risk to the target aquifer posed by an adjacent heavy industrial area, assist with well siting, assess long-term performance of the target aquifer, define the wellhead protection area, and optimize wellfield performance.
- *Stanford University, Stormflow Generation, Chickasha, OK.* Interactions between surface water, soil-water, and groundwater were evaluated with a three-dimensional model of coupled saturated-unsaturated subsurface and surface fluid flow. Detailed rainfall data were incorporated into the model to determine the relative importance of different stormflow generation mechanisms.
- *Monterey County Water Resources Agency, Salinas MtBE Investigation, Salinas, CA.* Conducted probabilistic analysis to evaluate likelihood of MtBE source areas. The study included a Monte Carlo hydraulic gradient analysis over space and time using regional groundwater maps and 13 years of monthly groundwater levels from dozens of production wells. Stochastic 1D and 2D solute transport simulations were conducted and combined with the hydraulic gradient analysis to determine the most likely and least likely MtBE source areas. Customized programming within a GIS framework was an essential tool for conducting the analyses.
- *West Valley Water District, Wellhead Treatment Project, Rialto, CA.* Developed a two-dimensional, steady-state analytical groundwater flow model for the Rialto-Colton Basin. The calibrated model was implemented to delineate source areas for two wells as part of a CDPH 97-005 permit application. In a separate phase of this project, a Remedial Investigation (RI) Summary report was also prepared under NCP guidelines.
- *Santa Clara Valley Water District, Groundwater Vulnerability Study, Santa Clara, CA.* Determined regional-scale risk to groundwater from potentially contaminating activities (PCA) in the Santa Clara Valley, Coyote, and Llagas subbasins, as part of a multifaceted effort. PCA risk was determined from large databases of economic and municipal activities, existing groundwater contamination sites, and land use in the study area.
- *Sedgwick, Detert, Moran, and Arnold, Regional-scale Pesticide Contamination Litigation Support, Fresno, CA.* Implemented a detailed three-dimensional conceptual model for a large region (2,184 km<sup>2</sup>) for a 35-year period in the Fresno area, which consisted of geologic data and the time-variant inputs/outputs of DBCP application rates

## Affiliations

American Geophysical Union (AGU)  
Geological Society of America (GSA)  
Groundwater Resources Association of California (GRA)

## Publications

### *Select Peer-Reviewed Publications*

- Loague, K., C.S. Heppner, R.H. Abrams, A.E. Carr, J.E. VanderKwaak, and B.A. Ebel, 2005. Further testing of the Integrated Hydrology Model (InHM): event-based simulations for a small rangeland catchment located near Chickasha, Oklahoma. *Hydrological Processes* 19, 1373–1398.
- Loague, K. and R.H. Abrams, 2001. Stochastic-Conceptual analysis of near-surface hydrologic response. *Hydrological Processes* 15, 2715-2728.
- Loague, K., G.A. Gander, J.E. VanderKwaak, R.H. Abrams, and P.C. Kyriakidis, 2000. Technical Addendum for “Simulating hydrologic response for the R-5 catchment: A never-ending story”. *Floodplain Management* 2, 57-64.
- Loague, K., G.A. Gander, J.E. VanderKwaak, R.H. Abrams, and P.C. Kyriakidis, 2000. Simulating hydrologic response for the R-5 catchment: A never-ending story. *Floodplain Management* 1, 57-83.
- Abrams, R.H. and K. Loague, 2000. Legacies from three former manufactured-gas plants: Impacts on groundwater quality. *Hydrogeology Journal* 8, 594-607.
- Abrams, R.H., K. Loague, and D.B. Kent. 1998, Development and testing of a compartmentalized reaction network model for redox zones in contaminated aquifers. *Water Resources Research* 34, 1531-1541.
- Abrams, R.H. and K. Loague, 2000. A compartmentalized solute transport model for redox zones in contaminated aquifers, 2, Field-scale simulations. *Water Resources Research* 36, 2015-2029.
- Abrams, R.H. and K. Loague, 2000. A compartmentalized solute transport model for redox zones in contaminated aquifers, 1, Theory and development. *Water Resources Research* 36, 2001-2013.
- Loague, K. and R.H. Abrams, 1999, DBCP contaminated groundwater in Fresno County: Hot Spots and nonpoint sources. *Journal of Environmental Quality* 28, 429-445.
- Loague, K., R.H. Abrams, S.N. Davis, A. Nguyen, and I.T. Stewart, 1998. A case study simulation of DBCP groundwater contamination in Fresno County, California: 2. Transport in the saturated subsurface. *Journal of Contaminant Hydrology* 29, 137-163.

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## **Jeffrey K. Meyer, B.S./P.E.**

### **Director, Water Resources Department**

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Mr. Meyer has twenty-one years of experience in environmental engineering and water resources management. His experience includes hydrology development, stream flow gaging, runoff forecasting, water rights analysis, model application development, long term planning, short term planning using position analysis, alternatives evaluation, operations rules development., hydroelectric system evaluation and computer-aided dispute resolutions.

Over the last several years, Mr. Meyer has been part of a team that has developed and improved HydroLogics, Inc OASIS with OCL operations and simulation modeling package. OASIS with OCL, along with its graphical user interface and post-processing programs, is an extremely powerful tool for water managers. It enables them to see how their system reacts to demand management options, supply management options, changes in operational rules, or changes in facilities, and helps provide managers with a realistic measure of their system's reliability Since the introduction of the model, Mr. Meyer has used OASIS with OCL to develop simulation applications of the model for the Metropolitan Water District of Southern California, the Placer County Water Agency, the South Florida Water Management District, the City of New York, the State of Kansas, and El Dorado Irrigation District.

### **Education**

B.S., Civil Engineering; California Polytechnic State University, San Luis Obispo

### **Registrations, Certifications, and Affiliations**

License/Certification/Permits	State	Date	
		Granted	Expires
Professional Engineer	California	1995	12/2013

- American Society of Civil Engineers

### **Professional Experience**

#### **Hydroelectric System Evaluation**

- Pacific Gas and Electric Company Hydroinvestiture, California Public Utility Commission
  - Middle Fork Project, Middle Fork American River, Placer County, California
  - El Dorado Irrigation District, El Dorado, Amador, Alpine Counties, California
  - Yuba Bear/Drum Spaulding, Yuba and Nevada Counties, California
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### **Stream Gaging**

- Placer County Water Agency, Middle Fork Project
- Placer County Water Agency, Water Delivery System
- Georgetown Divide Public Utilities District
- Yuba County Water Agency

### **Water Rights Analysis**

- Placer County Water Agency, Middle Fork Project
- Calaveras County Water District, North Fork Stanislaus Project
- Georgetown Divide Public Utilities District

### **Water Supply System Evaluation**

- Calaveras County Water District, Calaveras County California
- El Dorado Irrigation District Project 184, El Dorado, Amador, Alpine Counties, California
- Kansas River Basin, Topeka, Kansas
- South Florida Water Management District, West Palm Beach, Florida
- New York City Water Supply System, New York, New York
- CVP/SWP, Central Valley of California

### **Computer Aided Dispute Resolution**

- El Dorado Irrigation District Project 184, El Dorado, Amador, Alpine Counties, California
- Kansas River Basin, Topeka, Kansas
- South Florida Water Management District, West Palm Beach, Florida
- Sacramento Water Forum, Lower American River, Sacramento County, California

### **Hydroelectric System Evaluation**

**Pacific Gas & Electric Company Hydrodivestiture , California Public Utility Commission.** Pacific, Gas and Electric Company's hydroelectric systems located predominantly in the Sierra Nevada Foothills. This modeling effort was required for the PG&E hydrodivestiture by the California Public Utility Commission as a method of valuation of PG&E's facilities. The watersheds modeled include:

- Pit River
- North Fork Feather River
- Drum-Spaulding
- Potter Valley
- Stanislaus River
- Mokelumne River
- Crane Valley

**Middle Fork Project, Middle Fork American River, Placer County, California.** Placer County Water Agency's hydroelectric system is located on the Middle Fork of the American River. The project was built for water supply and generation and includes two major reservoirs and five powerhouses. Currently, Mr. Meyer, Senior Engineer, is working with PCWA to relicense the hydroelectric facilities with the Federal Energy Regulatory Commission (FERC). Throughout the process, Mr. Meyer has overseen the development of the hydrology, simulation model, and snowmelt runoff forecasting. In addition, Mr. Meyer has assisted the Agency with

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its power marketing efforts. During the relicensing process, Mr. Meyer coordinated the installation of several flow gages to collect data that was and is used in the development of the hydrology and operations. Using the available flow data and watershed characteristics like area and precipitation, Mr. Meyer was able to develop hydrology where no flow data existed. Mr. Meyer also led the model development team and was responsible for the construction, testing, and verification of the simulation model used in the negotiations. The model is a deterministic tool that runs on both a daily and hourly time step. The model is capable of simulating minimum flow requirements, reservoir operations and power operations. Used comparatively, it is capable of estimating the impacts to water supply and power generation due to various operating proposals and has been a cornerstone of the negotiations.

**El Dorado Irrigation District Project 184, El Dorado, Amador, Alpine Counties, California.** El Dorado Irrigation District purchased the Project 184 hydroelectric system from Pacific Gas and Electric Company to secure their water supply and to generate electricity. The Project recently was up for FERC relicensing which required modeling of the system using both monthly and daily time steps. Mr. Meyer created both versions of the model and used the model in a collaborative process. The model enabled the collaborative group to test various operating criteria during negotiations and ultimately reach settlement. The collaborative requested nearly 200 studies many of which were executed in the collaborative sessions. Mr. Meyer evaluated power revenue impacts during this process which was instrumental in the evaluation of the feasibility of some of the operating strategies.

**Yuba-Bear/Drum-Spaulding, Yuba and Nevada Counties, California.** Placer County Water Agency's receives a substantial water supply from Pacific Gas and Electric Company's (PG&E) Drum Spaulding project. Currently, PG&E along with its power partner Nevada Irrigation District is relicensing the Yuba Bear/Drum-Spaulding Project. Because of the concern PCWA has for protecting its water supply, they have hired Mr. Meyer to evaluate the water supply impacts due to the proposed license conditions and assist in the development of alternative proposed license conditions that will meet habitat needs while preserving most of the water supply. The model is capable of simulating minimum flow requirements, reservoir operations and power operations. Used comparatively, it is capable of estimating the impacts to water supply and power generation due to various operating proposals and has been a cornerstone of the negotiations.

## **Stream Gaging**

### **Placer County Water Agency, Middle Fork Project**

In support Federal Energy Regulatory Commission relicensing, Mr. Meyer coordinated the reconnaissance, permitting, installation and monitoring of twelve stream gages in the Middle Fork Project. The data from these gages has been used in hydrology development for use in the operations simulation model, temperature model and habitat model as well as for the development of runoff forecasting.

### **Placer County Water Agency, Water Delivery System**

As part of a mitigation measure for the construction of the American River Pump Station, PCWA is required to install five gages of Auburn Ravine to monitor the effects of the additional water pumped into the ravine. To date, Mr. Meyer has lead a team that has located, permitted and

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installed two gages on the ravine. Two other locations are being considered. This project is ongoing.

#### **Georgetown Divide Public Utilities District**

Georgetown Divide Public Utilities District had a long standing relationship with the United States Geological Survey (USGS) to monitor and maintain two gages on Pilot Creek. Both of the gages provided real time data to the USGS website. The ECORP Consulting team, lead by Mr. Meyer, took over the gaging services. Within a few days, the team replaced the USGS equipment and was able to transmit real time data to a password protected website.

#### **Yuba County Water Agency**

To fulfill the terms of a settlement agreement, YCWA is required to install two stream gages to monitor water diverted from the Yuba River. YCWA contacted Mr. Meyer to investigate and design the suitable measurement methods to monitor the flow in two channels. Because of the nature of the channels, acoustic Doppler gaging units were chosen to measure the velocity of the flow in the channel rather than stage as is typically done. The planning and design phase has been completed. Installation is anticipated in the next few months.

#### **Water Rights Analysis**

##### **Placer County Water Agency**

Placer County Water Agency holds multiple permitted water rights on the Middle Fork American River watershed. Because those permits expire in 2015 and PCWA has not fully developed the use of those rights, they are filing for extensions on those rights. Mr. Meyer is part of a team which is supporting the filing for an extension and is preparing an Environmental Impact Report (EIR). The cornerstone of the evaluation for the EIR is a simulation model, developed by Mr. Meyer, used to estimate impacts due to the planned development of the existing rights. The model contains operational flexibility bounded by the water rights permits, FERC License and agreements. The operational flexibility will be used to mitigate impacts.

##### **Calaveras County Water District**

Calaveras County Water District holds multiple permitted and Pre-1914 water rights on the North Fork Stanislaus River. The Utica Power Authority and the Northern California Power Agency also hold water rights on the NF Stanislaus. In addition to the complex operations on the NF Stanislaus, CCWD diverts water at Lake Tulloch on the Lower Stanislaus, below New Melones Reservoir. The water diverted by CCWD comingles with water owned by Tri-dams and Pacific Gas and Electric Company. Mr. Meyer directed the development of the hydrology and model development to evaluate the system for water rights usage and reporting. The modeling process developed by Mr. Meyer has been used to reach a memorandum of understanding amongst three operators within the Stanislaus watershed.

##### **Georgetown Divide Public Utilities District**

Georgetown Divide Public Utilities District holds multiple permitted and Pre-1914 water rights on Pilot Creek and its tributaries. Mr. Meyer developed a methodology for identifying the usage of

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those rights to satisfy the State Water Resources Control Board requirements for online reporting. Mr. is also assisting the District with licensing some of those rights.

## **Water Supply System Evaluation**

### **Calaveras County Water District**

Mr. Meyer prepared a simulation model of Calaveras County Water District's (CCWD) North Fork Stanislaus project and New Hogan Reservoir operations to evaluate the feasibility of a water transfer between the North Fork Stanislaus River and the Calaveras River. The model simulates the operations of New Spicer Meadows Reservoir, McKays Point Dam, Mill Creek Tap, Collierville Powerhouse, New Melones Reservoir, and New Hogan Dam.

**El Dorado Irrigation District Project 184, El Dorado, Amador, Alpine Counties, California.** El Dorado Irrigation District recently purchased the Project 184 hydroelectric system from Pacific Gas and Electric Company to secure their water supply and to generate electricity. Because the District must operate to a new set of operating criteria established through the FERC Relicensing process, the operators requested that Mr. Meyer prepare an operations forecasting model to aid in their decision making process. The model uses a runoff forecasting procedure to estimate water supply availability and the new operating criteria to help the operator identify how much discretionary water is available for power production.

**Kansas River Basin, Topeka, Kansas.** Mr. Meyer prepared a simulation model of the Kansas River Basin for the Kansas Water Office to test proposed operating rules and determine the to determine how future level demands could be met without adversely effecting the water quality targets. Mr. Meyer used the model in a collaborative group to assess the ability to meet the water purveyor's needs while still meeting the storage, flow, and water quality requirements.

**South Florida Water Management District, West Palm Beach, Florida.** Prepared a model of South Florida for the South Florida Water Management District. The model includes Lake Okeechobee, the Everglades Agricultural Area, the urbanized Lower East Coast, and the Everglades National Park. The model is used to implement and develop operating strategies to supply the competing demands of the agricultural, urban, and wildlife areas.

**New York City Water Supply System, New York, New York.** Prepared a simulation model of New York City's water supply system. We are using the model to identify the costs and benefits of proposed future improvements and operating strategies. The model includes the Delaware River, Hudson River, Brooklyn-Queens Aquifer, and the Croton Watershed.

**CWP/SWP, Central Valley of California.** Developed a model of California's Central Valley Project and State Water Project using OASIS with OCL. The model was developed as a screening tool for DWRSIM to be used by the Metropolitan Water District of Southern California. The model was used to evaluate the impacts due to the Central Valley Project Improvement Act and to determine the benefits of the measures (tools) proposed to mitigate the impacts.

**Drum-Spaulding System, Nevada & Placer Counties, California.** Developed a model of the Drum System (Yuba and Bear River Watersheds)

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using OASIS with OCL. The model was developed for the Placer County Water Agency to be used to understand the capabilities of the system and how operational changes could impact water supply.

**Sacramento County EIS, Lower American River, Sacramento County, California.** Performed numerous operation studies using PROSIM for Sacramento County, Sacramento Municipal Utility District and City of Sacramento in preparation for environmental impact reports which will explore the impact of increased diversions from the American River and water transfer capabilities.

**CWP/SWP, Central Valley of California.** Evaluated the State Water Resources Control Board Draft December 15, 1994 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; also determined water supply impacts of the standards, using the U.S. Bureau of Reclamation's simulation model, PROSIM.

**CWP/SWP, Central Valley of California.** Evaluated proposed Environmental Protection Agency standards for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; also determined water supply impacts of EPA standards, using PROSIM.

**Folsom Lake Reoperation Evaluation, Folsom, California.** Used PROSIM to analyze Folsom Reoperation Flood Control Alternatives for the Sacramento Area Flood Control Agency. Analysis included data development and manipulation to achieve acceptable runs for this model.

**Alameda County Water Agency, Alameda, California.** Developed a water operations model for the Alameda County Water District, including model schematic and input data development, as well as hydrologic time series data.

### **Computer Aided Dispute Resolution**

**El Dorado Irrigation District Project 184, El Dorado, Amador, Alpine Counties, California.** El Dorado Irrigation District purchased the Project 184 hydroelectric system from Pacific Gas and Electric Company to secure their water supply and to generate electricity. The Project recently was up for FERC relicensing which required modeling of the system using both monthly and daily time steps. Mr. Meyer created both versions of the model and used the model in a collaborative process. The model enabled the collaborative group to test various operating criteria during negotiations and ultimately reach settlement. The collaborative requested nearly 200 studies many of which were executed in the collaborative sessions. Participants included California Department of Fish and Game, U.S. Forest Service, California State Water Resources Control Board, El Dorado County Water Agency, Alpine County, Amador County, Rafting enthusiasts, Fly fishermen, and several others.

**Kansas River Basin, Topeka, Kansas.** Mr. Meyer prepared a simulation model of the Kansas River Basin for the Kansas Water Office to test proposed operating rules and determine the to determine how future level demands could be met without adversely effecting the water quality targets. Mr. Meyer used the model in a collaborative group to assess the ability to meet the water purveyor's needs while still meeting the storage, flow, and water quality requirements.

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**South Florida Water Management District, West Palm Beach, Florida.** Mr. Meyer prepared a model of South Florida for the South Florida Water Management District. The model includes Lake Okeechobee, the Everglades Agricultural Area, the urbanized Lower East Coast, and the Everglades National Park. Mr. Meyer used the model to implement and develop operating strategies to supply the competing demands of the agricultural, urban, and wildlife areas and to test the operating policies in the Lower East Coast Regional Water Supply Plan. The Plan integrates water supply policies for the Lower East Coast of Florida with the delivery of water to enhance and maintain conditions in the Everglades and in Lake Okeechobee, from environmental conditions to ground water draw down, economic impacts, and water supply reliability. In a collaborative session following the development of the plan, Mr. Meyer met with the policy makers to scrutinize the plan with the OASIS model and when oversights were discovered, the policy makers discussed the possible solutions and the suggestions were tested until a suitable outcome was reached.

**Sacramento Water Forum, Lower American River, Sacramento County, California.** Facilitated the Surface Water Negotiation Team's American River negotiations between water purveyors and environmentalists who wish to produce a mutually-acceptable solution to address the requirements and needs of both the surrounding communities and the Anadromous Fish Doubling Act. Used PROSIM, Salmon Mortality Model, and American River Temperature model to evaluate the changes in monthly flow and water temperature in the Lower American River under various diversion scenarios.

### **Selected Publications**

Sheer, D.P., Pulokas, A.P., Meyer, Jeffrey K., Randall, D, Meyer H.W. (1999) *Operations Control Language (OCL™) - the key to a flexible planning model*. Proceedings of the 26<sup>th</sup> Annual Water Resources Planning and Management Conference.

Meyer, Jeffrey K., Pulokas, A.P., Meyer, H.W., Sheer D.P. (1999) *Optimization Using OASIS with OCL™ : A California Application* Proceedings of the 26<sup>th</sup> Annual Water Resources Planning and Management Conference.

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## **Jared Emery, E.I.T.**

### **Water Resources Analyst**

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Mr. Emery has 6 years professional experience as a water resources analyst for ECORP Consulting, Inc. that includes hydrology development, model application development, drought analysis, flood frequency analysis, water rights analysis, water quality assessments, and hydroelectric system evaluation.

### **Education**

Humboldt State University, California, 9/99 to 5/05

### **License / Certification / Permits**

Engineer-in-Training - California, 2011

### **Professional Experience**

**Water Supply Model for the Middle Fork American River Hydroelectric Project, Placer County – Placer County Water Agency (2006 – Present).** Mr. Emery participated in the development of a simulation model of the Middle Fork of the American River and Rubicon River using OASIS with OCL for Placer County Water Agency to be used as a long-term planning tool to provide water supply and power production analysis. The model included development of hydrology for the Middle Fork American and Rubicon Rivers, and was used as a tool in the Federal Energy Regulatory Commission (FERC) relicensing process, where Mr. Emery performed model simulations with the stakeholder group.

**Water Supply Model for Calaveras County Water District, Calaveras County – Calaveras County Water District (2007 – Present).** Mr. Emery created a water supply model for Calaveras County Water District that included the Utica/Angels power systems. The model included the operation of New Melones, New Hogan, and New Spicer Meadows reservoirs, as well as several smaller reservoirs and diversion dams and five powerhouses. Development of operating rules at New Melones reservoir included analysis of Calsim model rules and calibrating the water supply model to Calsim model results. The model was used to conduct a water rights analysis, and compare alternate inter-basin transfer schemes and analyze their affect on Utica Power System's generation. Mr. Emery also developed hydrology for North Fork Stanislaus, Calaveras River, Angels Creek, and Mill Creek.

**Granite Power House Aggregate Expansion Project, Butte County – Granite Construction (2009).** Mr. Emery performed water surface modeling using HEC-RAS on the Feather River as part of a flood frequency analysis.

**Sugar Pine Reservoir Study, Placer County – Foresthill Public Utility District, 2007.** Foresthill Public Utility District was asked to do a study on sugar pine reservoir for the proposed annexation of land for a planned development. Mr. Emery did hydrology development for Shirttail Creek and Mill Creek. He created a water supply model of the district's system using

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OASIS software to determine reliable yield and analyze the potential benefits of reservoir improvements and changes in reservoir operations.

**Water Supply Model for the Yuba Bear Drum Spaulding Hydroelectric Project, Placer County – Placer County Water Agency (2010 – Present).** Mr. Emery participated in the development of simulation model runs of the Yuba Bear Drum Spaulding project using HEC-ResSim for Placer County Water Agency to provide water supply and power production analysis.

**Fluvial Geomorphic Assessment for Rock Park White Water Park, Sparks, Nevada – City of Sparks (2008-2009).** Mr. Emery installed, surveyed, and geo-referenced 38 monumented cross-sections for a fluvial geomorphic assessment of the Truckee River in Sparks. Information obtained during this assessment was used to obtain baseline conditions for the river reach before construction of the white water park.

**Rainfall Runoff Analysis for Norris Canyon Estates, Contra Costa County – Toll Brothers (2007-2008).** Mr. Emery performed rainfall runoff analysis using HEC-HMS and water surface modeling using HEC-RAS on a tributary to San Catanio Creek.

**Post-Construction Water Quality Manual for the City of Lathrop Stormwater Management Program, San Joaquin County – City of Lathrop (2006).** Mr. Emery helped develop a Post Construction Water Quality Manual for the City of Lathrop as part of their NPDES phase II permits. This involved assisting in the design of construction standards incorporating low impact development methods, including requirements for source controls and treatment controls.

**Post-Construction Water Quality Manual for the Sacramento and South Placer Regions, Sacramento and Placer counties – City of Roseville (2006).** I. Mr. Emery assisted in the development of a Post Construction Water Quality Manual for the Sacramento and South Placer Regions, which include the cities of Sacramento, Folsom, Roseville, and Elk Grove, as required by their NPDES phase II permits. This involved assisting in the design of construction standards incorporating low impact development methods and the design of a scoring system to determine whether the low impact development standard had been met.

**Bickford Ranch, Placer County – SunCal Properties 2006. Post-Construction Water Quality Management Plan.** Mr. Emery was involved in the development of Post-Construction Water Quality Management Plan for Placer Ranch, which is subject under NPDES phase II permits. This involved incorporation of low impact development methods into construction standards. Mr. Emery was also involved in development of an inventory of all oak trees on the project site.

### **Professional Development Courses**

- Hydrologic and Hydraulic Analysis Using ArcGIS: Environmental Systems Research Institute (ESRI), September 2006.
  - ASCE HEC-RAS Steady Flow Analysis workshop (3 days)
  - Wildland Hydrology Applied Fluvial Morphology Level I (5 days)
  - Wildland Hydrology Applied Fluvial Morphology Level II (5 days)
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